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THE CULTIVATION OF AMERICAN GINSENG.

BY

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LETTER OF TRANSMITTAL.

U. S. Department of Agriculture,
Bureau of Plant Industry,
Office of the Chief,
Washington, D. C., May 29, 1913.

Sir: I have the honor to transmit herewith a paper entitled "The Cultivation of American Ginseng," by Dr. Walter Van Fleet, which has been submitted by Dr. R. H. True, Physiologist in Charge of Drug-Plant, Poisonous-Plant, Physiological, and Fermentation Investigations, and to recommend that it be published as a Farmers' Bulletin.

Respectfully,

Wm. A. Taylor,
Chief of Bureau.

Hon. D. F. Houston,
Secretary of Agriculture.

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THE CULTIVATION OF AMERICAN GINSENG.

INTRODUCTION.

American ginseng is a fleshy-rooted herbaceous plant growing naturally on the slopes of ravines and in other shady but well-drained situations in hardwood forests in varying abundance from Maine to Minnesota and southward to the mountains of Georgia and the Carolinas. It has long been valued by the Chinese for medicinal use, though rarely credited with curative virtues by the natives of other countries. The dried roots have been exported from this country in increasing quantities since the early years of the eighteenth century, the prices rising as the wild supply diminished because of the clearing away of suitable forests from about 40 cents a pound in the early years of its collection to more than $6 a pound for the best qualities during the last eight years.

The cultivation of native ginseng, stimulated by its increasing scarcity and the rising prices, began in an experimental way about 15 years ago and has attained such proportions that the output of cultivated roots is little short of that collected from the forests and in the present state of the market has nearly the same value. It is reasonable to assume that the cultivated root must eventually displace the wild article as a commodity for export, but any rapid increase of production at this juncture might depress selling prices, which are not thought to exceed greatly the cost of growing and marketing, when the slow development of the plants and the relatively expensive equipment needed for ginseng culture are duly considered.

A negligible quantity of ginseng root is consumed by Chinese residents of North America, and a trifle has been used by manufacturers of domestic medicine, leaving practically the sole outlet for this product with the Koreans and Asiatic Chinese. The exports and

valuation of American ginseng for the nine years ended June 30, 1912, are as follows:

TABLE I.—*Exports and value of ginseng from 1904 to 1912, inclusive.*

Year.	Pounds.	Total value.	Average value per pound.
1904	132,882	$851,820	$6.41
1905	146,576	1,069,849	7.56
1906	160,949	1,175,844	7.30
1907	117,696	813,023	6.80
1908	154,180	1,111,994	7.21
1909	186,257	1,270,632	6.82
1910	192,406	1,439,434	7.48
1911	153,999	1,088,202	7.06
1912	155,308	1,199,301	7.20

As yields of dry root from well-managed plantings appear to be at the rate of a ton to the acre, it will be realized that the product of 100 acres of mature root could very readily supply our present average exportation of 164,530 pounds. This would represent total plantings of nearly 700 acres, as it requires at least six years to grow marketable roots from seeds. Taking into consideration the growing interest in ginseng culture, the increasing output, and the probability that wild roots may continue to furnish a supply for some years, it appears best to regard the future of the industry with conservatism.

THE GINSENG PLANT.

American ginseng (fig. 1) is botanically known as *Panax quinquefolium*, of the family of Araliaceæ. In its wild state it grows from 8 to 20 inches high, bearing three or more compound leaves, each consisting of five thin, stalked, ovate leaflets, pointed at the apex and rounded or narrowed at the base, the three upper leaflets being larger than the two lower ones. A cluster of from 6 to 20 small greenish yellow flowers is produced in midsummer, followed later by as many bright-crimson berries, each containing from one to three flattish wrinkled seeds the size of small peas.

The root is thick, spindle shaped, 2 to 4 inches long, and one-half to 1 inch or more in thickness, generally branched in the older specimens and prominently marked with circular wrinkles. Branched roots having some resemblance to the human form are said to be in particularly high favor in China.

The seeds (fig. 2) are slow in germination and should never be permitted to dry out. They are usually stratified in moist sand, old sawdust, or woods earth and stored in a damp, cool place until cracked by incipient germination, which may be considerably delayed and usually does not occur until the year following their ripening. The subsequent development of the plant is also relatively slow, as it

requires from five to seven years to grow marketable roots from seeds or young roots. Under favorable circumstances the plants begin to fruit about the third year and when over 5 years old may produce as many as 50 seeds annually.

The older roots possess the most substance and when properly cured realize the highest prices. It appears almost useless to offer for sale 3-year or 4-year roots, even if well grown and of good size, as buyers for the Chinese market have learned to discriminate against them.

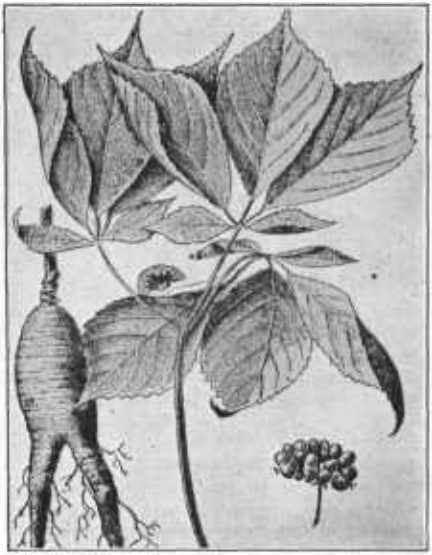

FIG. 1.—Branch, root, and berries of American ginseng. (Reproduced from Bulletin 16, Division of Botany.)

STARTING THE PLANTATION.

In planting ginseng beds it has been found desirable to start with both young roots and seeds. By securing roots three or more years old a moderate seed crop may be had the first season. A stock of 1-year or 2-year roots set at the same time will start the rotation, and it is well to plant seeds also if germinated ones are available.

Seeds and roots of various ages for stock are freely offered by dealers advertising in current horticultural periodicals. Seeds are now procurable at prices varying from $1 to $2.50 per thousand, and roots from 50 cents to $3 per hundred, according to age and source. Stratified seeds cost about 50 per cent more than fresh seeds, but may be regarded as far more useful for beginners. There are about 8,000 seeds in a pound. As the output of seeds is likely in time to exceed the capacity of the plantation, it is well to restrict the production by nipping the flower heads, unless a good market for the seeds is

nssured. Roots gain more rapidly in size and weight if the plants are not permitted to seed.

While small dooryard and woodland plantings may be grown with little outlay, ginseng culture on a large scale is quite expensive. The cost of equipping and starting ginseng beds on a commercial basis does not appear under present conditions to fall far short of $1,500 per acre, exclusive of the value of the land.

THE CULTURE OF GINSENG.

Ginseng grows naturally in rather dense shade and when placed under cultural conditions must be shielded from direct sunlight by tree shade or some construction that will reduce the light to about one-fourth its normal intensity. This may be accomplished by planting it in forest beds, or, in cultivated ground, by erecting sheds open to the north and possibly to the east, but covered at the top and the south and west with laths or boards so spaced as to cut out nearly three-fourths of the sunlight. Brush and heavy burlap have been used with fair success for shading, but thin or ordinary muslins are useless, as they do not intercept enough light. Denser shade is required in southern localities than in the North. The rule appears to be one-sixth sunlight in the latitude of Kentucky and somewhat denser south, rising to one-fourth or more in Michigan and Wisconsin. In the North, where open construction is preferred, Lima beans or morning-glories may be planted on the south and west sides and allowed to run on poultry netting, thus furnishing shade during the brightest summer months.

FIG. 2.—Seeds of American ginseng. (Natural size.)

There are many methods of construction, but the most common is to set posts firmly in the ground 8 feet apart each way and about 7 feet high above the ground. Scantlings 2 by 4 inches in size are nailed on top of the posts, running the long way of the shed. The shade is usually made in sections 4 by 8 feet long, using common 4-foot laths or slats nailed on strips 2 by 2 inches and 8 feet long. The laths should be spaced from one-fourth to one-half inch apart, according to locality, whether in the North or in the South. These sections of

shading are laid on top of the 2 by 4-inch runners and so nailed to the posts that the laths run about north and south, thus giving the plants below the benefit of constantly alternating light and shade. (Fig. 3.)

For covering seed beds a rather low shade is desirable, in order to prevent the washing out of the seeds by the drip from the laths. Poultry netting covered with brush, straw litter, or burlap, made light in spring and denser as the sun gains power, answers very well.

The beds under shade should be 4 feet wide and preferably should run east and west, being so placed that the drip will fall to a great extent in the paths. The sides may be of 12-inch boards set 8 inches or more in the ground to keep out moles and held in place with small

FIG. 3.—Lath shed affording partial shade, especially well suited for growing ginseng and other woodland plants.

stakes. The soil should be fairly light and so well drained naturally or artificially that water can at no time remain on the beds. It should be in a condition to grow good vegetables without the addition of strong manure.

The very best fertilizers are woods soil or rotted leaves 4 to 6 inches deep, well incorporated to a foot in depth, and fine raw bone meal well worked in, applied at the rate of 1 pound to each square yard. If yard manures are used they should be very thoroughly rotted and in order to give the best results should be worked in some months previous to planting the beds. Chemical fertilizers and wood ashes

have been used, but as seriously injurious results have sometimes followed it is best, for the beginner at least, to depend on rotted leaves and raw ground bone to enrich the soil. For seed beds the soil should be half woods earth, free from fiber, and if inclined to be heavy, enough sand should be added so that the mixture will not bake or harden even after heavy rains.

PLANTING THE BEDS.

Ginseng seeds are best planted in spring as early as the soil can be worked to advantage. Only cracked or partially germinated seeds should be used. They may be planted 6 inches apart each way in the permanent beds or 2 by 6 inches in seed beds and transplanted to stand 6 or 8 inches apart when 2 years old. The seeds should be covered 1 inch deep with woods soil or old rotten hickory or basswood sawdust. That from pine or oak trees should not be used. The roots may be set any time from October to April when the soil is in suitable condition, the crowns being placed about 2 inches below the surface. The most approved distances to plant are 6 or 8 inches apart each way, the latter being preferred when 7-year-old roots are to be grown.

Many planters round the surface of the beds, making the center several inches higher than the sides, since they find space for more plants on the curved than on the flat surface; but others claim that the possible injury from drought in very convex beds more than offsets this advantage. It is important, however, to have the centers high enough not to retain water after a rain. For roots the beds should be worked fully 12 inches deep, but the seed beds need not be so deeply stirred, as it is not advisable to have them settle to any marked extent.

Ginseng needs little cultivation, but the beds should at all times be kept free from weeds and grass, and the surface of the soil should be scratched with a light tool whenever it shows signs of caking. Ginseng seedlings grow about 2 inches high the first year, with three leaflets at the apex of the stem. The second-year plants may reach 5 or 6 inches in height, bearing two compound leaves each composed of five characteristic leaflets. A third leaf is generally added the next year and fruits may be expected. In succeeding years a fourth leaf is formed and the fruiting head reaches its maximum development, sometimes producing as many as 100 seeds, but the average under cultivation seldom exceeds 40 seeds to a plant.

MULCHING.

In accordance with natural conditions a winter mulch over the crowns is essential, especially in northern localities. Forest leaves held in place with poultry netting or light brush are best, but corn-

stalks stripped of the husks, bean vines, cowpea hay, or other coarse litter not containing weed seeds or material attractive to mice will answer the purpose. It should not be placed in position until actual freezing weather is imminent and should be removed in spring before the first shoots come through the soil.

A mulch of 4 or 5 inches of leaves or their equivalent in litter is ample for the severest climate, and less is needed in the South. Seedling beds particularly require careful mulching to prevent heaving by frost.

VENTILATION.

Free ventilation is very necessary for ginseng. In the forest, owing to the height of the protective canopy of trees, air currents are almost constant. This condition should be borne in mind in the construction of artificial shade, and the shed should contain as few obstacles as possible to the free circulation of air. Open sides at the north and east will generally insure free ventilation.

PROTECTION.

Owing to the comparatively high cost of ginseng plants and roots, the beds should be well protected by secure fences from the intrusion of wild or domestic animals and should also be securely guarded against theft, which is not uncommon with this high-priced product. Protection is especially needed with forest plantings, which should always be well inclosed. Moles may be controlled with suitable traps, of which there are several kinds on the market, or the beds may be guarded with boards or wire netting of sufficiently close mesh set 12 to 18 inches in the ground.

GINSENG VARIETIES.

The culture of native ginseng has been too brief to induce varietal changes, but liberal fertilization and continual selection of seeds from individual plants having superior commercial characteristics will doubtless in the end favorably modify the wild type of plants. There are, however, various recognizable geographical races, not all of the same value to the grower. Plants from the northern range, particularly those indigenous to New York and Wisconsin, appear to possess the most useful characteristics and form the best basis for breeding stocks. Southern ginseng, though vigorous and forming roots of good size and shape, does not seed well in northern localities, evidently finding the season too brief. Some of the western types have long, thin roots of undesirable character, and another local form, dwarf in growth, has small, round, and almost worthless roots. The beginner should endeavor to procure from reliable dealers the best commercial types of ginseng as a foundation for his breeding stock.

DISEASES OF GINSENG.

The diseases of cultivated ginseng appear to be chiefly incident to the crowding of the plants, deficient drainage, and lack of ventilation. In their natural state the plants as a rule are thinly scattered on the forest floor under advantageous conditions of ventilation and soil drainage, the normal action of tree roots playing no inconsiderable part in the latter condition, and diseases, of which there are several, are likely to remain quite local in effect; but under the crowded conditions of commercial culture they tend to spread and may cause material injury. Errors in fertilization and soil treatment are also fruitful sources of injury and by weakening the resistance of the plants further invite the inroads of disease. Bulletin No. 250 of the Bureau of Plant Industry treats of ginseng diseases and their control in the light of the most recent researches. Prospective growers will find it of advantage to consult this work.

FOREST PLANTINGS.

The earlier successes with ginseng culture were made with forest plantings, and this method is still preferred by many growers where the proper conditions are available. The shade should be fairly dense, but should be produced by tall, open-headed trees rather than by undergrowth. Good drainage is essential, as the plants will not thrive in wet soils. The soil should be deeply plowed or spaded, all tree roots removed, and their further encroachment should be prevented by cutting around the beds yearly with a sharp spade. Leaf mold or well-decayed litter should be liberally worked into the soil, and an application of bone meal raked into the surface will in most cases prove a useful addition. The culture of forest beds is in all respects similar to that under artificial shade, and the winter mulch should in no case be omitted.

DIGGING THE ROOT.

The cured root is valued by the Chinese largely according to its size and maturity. The best qualities of proper age break with a somewhat soft and waxy fracture. Young and undersized roots dry hard and glassy and are regarded as less desirable. Very small roots and root fibers often realize less than a dollar a pound, while those of the proper size and quality sell readily at top quotations. Cultivated roots as a rule attain greater size than wild ones of the same age, but lack density of substance until well past the fifth year of development.

Beds should rarely be dug for market until the sixth year, and should then be taken up solidly and the undersized roots replanted or securely heeled in until time to plant in the spring. Good roots should run nearly 4 inches long, half an inch in thickness below the crown, and average about an ounce in weight in the fresh state.

Roots may be dug at any time after growth ceases in September, but mid-October is regarded as the most favorable time. They should be carefully washed or shaken free of all adhering soil, but not scraped, as it is important to preserve the natural dusky color of the skin with its characteristic annular markings.

Curing is best effected in an airy room heated to about 80° F. by a stove or furnace. The roots are spread on lattice trays and are frequently examined and turned, but must always be handled gently to avoid breaking the forks or marring the surface. It requires nearly a month of drying to cure the larger roots properly, but the heat may well be diminished toward the end of the process except in noticeably damp weather. In all stages of curing particular care should be taken to see that the root does not mold or sour, as any defect will greatly depress the selling price. On the other hand, overheating should be avoided, as it tends to discolor the surface and spoil the texture of the interior. Once well cured, the roots should be stored in a dry and airy place, secure from vermin, until ready for sale. The market lies with the wholesale drug dealers, some of whom make a specialty of buying ginseng root for export.

CONCLUSION.

Ginseng is a native product of recognized importance. The export trade in dry roots has existed for more than a century and has attained an average value of over a million dollars annually for the past decade.

The natural production, diminished by overcollection and the contraction of suitable forest areas, has dwindled to such an extent that prices have risen to levels warranting cultivation, which has proved quite successful in judicious hands. The plant, however, has little domestic value except for the exploitation of amateur cultivators and depends on a distant oriental market for its standing as a commodity. As a commercial product it would appear particularly liable to overproduction, which danger, however, is greatly lessened by the slow development of the plant and the inherent difficulties of its cultivation.

Under the present conditions of production ginseng offers attractive possibilities to patient cultivators who are in sympathy with the limitations of growth and the slow development of woodland

plants in general and who are willing to make a material outlay with only scanty returns in view for several years to come, but it holds out little inducement for inexperienced growers looking for quick profits from a small investment.

The culture of ginseng and of special crops generally is best begun in an inexpensive and experimental manner, enlarging the equipment only as reasonable success seems assured. "Plunging" in ginseng is as likely to prove disastrous as in other forms of business enterprise.

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